

No-till is too much! – A Canadian perspective on growing wheat

MIKE ROBERTS

Even with 900mm annual rainfall, Canadian wheat can still run short of moisture, according to Canadian agronomist Peter Johnson.

That sounds remarkable, but the detail behind the statement changes the picture.

In Canada the rain falls year round, at about 75mm a month, paddocks are under snow for four months and are tile-drained to remove water so crops can be sown. As a result the usable moisture for Canadian crops is not much different from that on an SA farm that receives 90% of a 425mm annual rainfall as growing season rain. Consequently, high-yielding Canadian crops often run short of moisture at grain fill despite the 900mm annual rainfall figure, explained Peter, a soil and crop specialist with the Ontario Ministry of Agriculture, Food and Rural Affairs.

When corn yields in Ontario were around 7.5t/ha, in the 1990s, it didn't really matter what the rainfall was at grain fill, he said. Now yields are double that and if there isn't enough rainfall during the growing season the crops run out of water.

"Drought resistant crops are a misnomer. What they are really talking about is precipitation use efficiency, not water use efficiency. We haven't changed water use efficiency one iota!

"If you want more yield out of the water available you need to access more of the soil moisture by growing bigger root systems."



CANADIAN AGRONOMIST PETER JOHNSON HAS NO DOUBT ABOUT THE VALUE OF TWITTER AS A COMMUNICATION TOOL IN AGRICULTURE, THE IMPACT OF TEMPERATURE ON WHEAT GROWTH OR THE BENEFITS OF ZERO TILLAGE, STUBBLE RETENTION AND SEEDING ACCURACY.

Run-off

Growing crops and cover crops with bigger and better root systems may have other benefits too.

Agriculture in Canada is under fire for contributing to algal blooms in and around the Great Lakes by allowing phosphorus and other nutrients to run off farmland into the lakes' which has focused attention on tillage and fertiliser management.

Soil erosion caused by tillage in Canada is 10 times worse than water and wind erosion combined, Peter said, which has led to a new battle cry – Roots Not Iron.

"We think that if a great root structure exists that we can plant directly into, the roots will do the tillage for us. That means we actually spray a cover crop after we plant into it."

Lack of moisture could make that concept difficult to implement in Australia, he said, but it was worth looking at.

Everything in a farming system is interrelated, he said.

"If you change one thing, tillage for example, it changes everything else. Early research in Canada studied the impact of changing a range of different factors. Getting crop sequence wrong could result in 13% less yield. Making the right equipment modification could pick up as much as 23%.

"Trying to figure out the impacts of all of the pieces of the puzzle becomes the difficult part."

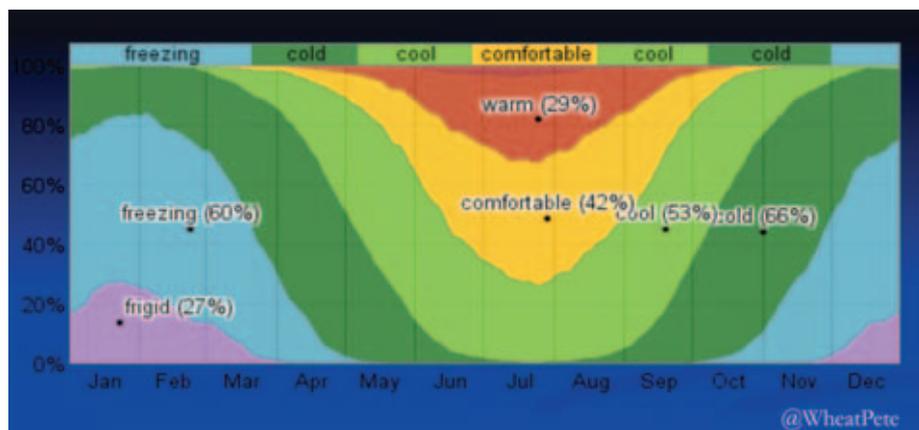


FIGURE 1

Temperature

One of those pieces is temperature.

“Understanding the impact of temperature on the growth of wheat can be illuminating. Wheat plants grow best with an 18°C daytime temperature and a 10°C night time temperature. When the temperature is over 18°C, the respiration and development of wheat is too fast and yields are not maximised.”

The light green band in Figure 1 indicates the ideal temperature band. In May and June, as Canadian crops are maturing, about 50% of the daily temperatures are in the 10-18°C zone. If that were the grain fill period it would be ideal, he said, but because of the way most crops are grown, grain fill in Canada is usually from about June 10 to July 20, when temperatures are usually much higher. This means there is an opportunity to increase yield if crops can be manipulated to keep heading in that cool temperature zone.

When the temperature exceeds 38°C, wheat can virtually go into shock, he said, with soil temperature having more influence than air temperature, especially in the Southern Hemisphere where wheat is planted at the end of summer, rather than the end of winter as is the case in Canada.

It is often assumed that because Australian wheat is grown in winter it is exposed to less solar radiation, Peter said, but if Australian growers can extend the period of grain fill their crops could have more

SOCIAL MEDIA A VALUABLE TOOL

“It astounds me how many people do not understand the value of Twitter as an agricultural tool,” Peter Johnson told growers at the SANTEFA conference.

Peter, who also answers to Wheat Pete, his Twitter handle, is a soil and crop specialist with the Ontario Ministry of Agriculture, Food and Rural Affairs.

He believes the new media is so valuable that ‘if your agronomist is not on twitter, get a different agronomist’, a position he reinforced with his experiences around army worm, an infrequent but damaging pest in Canada.

It can take up to 10 days to get information about an army worm outbreak to growers through the print media, by which time it was almost always too late to take action to control the pest, he said.

Twitter and other social media have changed that.

“The last time we had army worm I tweeted the news at 10am and that night sprayers were out all over the countryside. It was the first time in my career we were able to make a difference. Twitter is an incredible agricultural tool.”

yield potential than Northern Hemisphere wheat grown in summer.

Table 1, which compares conditions in Ontario and in New Zealand (NZ) shows that NZ has 40 days of grain fill and Ontario has 34 days. There is more solar radiation in Ontario but the temperatures are not as good for wheat growth, with every day in which the temperature exceeds 25°C during grain fill reducing yield potential by 0.07t/ha.

Residue management

Peter understands why burning is occasionally practiced in Australia, but considers the value of residue cover to be so great that ‘burning makes me go ballistic!’.

“In your Australian climate, baling straw should be outlawed! If you are going to spread the chaff, spread it evenly across the paddock or make sure it is in a very narrow, fine windrow where it can break down quickly.”

Uneven residue spread, particularly by older harvesters, can really affect soil temperature in Australia, particularly at planting time, he said, and there is always more moisture under residue than where there is no residue.

“Residue layers can help keep the crop canopy temperature down. When crops are filling with grain, the only thing they can do to keep the temperature down is pump water and that is easier if the water is cool. Water is colder under residue than where there is no residue.”

Crop uniformity

Seed placement is critical and seeders perform differently in areas with different residue cover, which can affect early growth, Peter said.

“As soon as you become a corn grower you become a real farmer because you only put down 35,000 seeds on an acre so all of a sudden you can see the difference between plants and make the effort to do a better job.

“When wheat farmers want to grow more wheat they buy more acres rather than try to do a better job on every acre. I want you to think about growing a better crop on every acre and thinking about crop uniformity is one of the ways to do it!”

Residue management is one of the key factors in US corn growers’ achieving

Grain fill conditions critical

Need bright but cool days

	NZ	ON
Grain fill: 660 day ⁰ C (days)	40	34
Latitude	43S	43N
Radiation (mj/day)	20.9	22.2
Potential grain fill/day (t/ha)	0.27	0.29
Potential grain fill (t/ha)	10.8	9.9
Whole crop model (t/ha)	14.2	11.9
Av. yield for 2010-14 (t/ha)	8.18	5.5
% of potential	58%	44%

@WheatPete

TABLE 1

uniform emergence and crop development, he said. “They actually try to get the residue out of the row in the spring and then plant corn on it. Falling off that strip can reduce yields by 0.5t/ha.”

For wheat growers, accurate depth control is the key to getting a uniform stand.

“Sowing at 25mm keeps the crown roots as deep as possible because wheat plants always set the crown at 18-25mm below the surface regardless of the planting depth.

“Crown depth is determined by when the plant senses the light so sowing 75mm deep won’t help you to get a deeper root system. Wheat plants sown at 25mm turn out to be the biggest and fastest growing with the highest yield potential. The earlier they are out of the ground the more uniform they are and that translates into yield.”

Soil erosion caused by tillage in Canada is 10 times worse than water and wind erosion combined.

Peter has a simple message for growers wanting to improve seed placement accuracy – ‘Get rid of that stupid hoe drill!’ (tined machine) and use a disc seeder because the way to ensure accurate seed placement is to sense the depth right beside where the seed will be placed.

Australian and Western Canadian farmers love tined seeders ‘because any idiot can run one!’ and they need very little upkeep, he said, but they ‘put the seed anywhere’.

A disc drill requires more maintenance and a better operator (who needs to get out of the tractor cab occasionally to check what sort of a job the seeder is doing) but makes it possible to achieve the seed placement accuracy he believes is essential for optimal crop performance.



THE VARIATION IN THESE CORN COBS CAN BE TRACED BACK TO INACCURATE SEED PLACEMENT – POOR CONTROL OF SEEDING DEPTH.

NITROGEN + FUNGICIDE: WHEN 1+1=2.5

Canadian researchers have found there is a compound effect from using nitrogen and fungicides on wheat.

Peter Johnson, a soil and crop specialist with the Ontario Ministry of Agriculture, Food and Rural Affairs (OMFRA), told growers at the SANTFA conference that research into nitrogen response ‘has been pretty boring’ and that 22 years of research suggests fungicides in wheat ‘always just basically broke even’.

So he was more than a little surprised by what he found when he ran some trials with nitrogen plus a fungicide on wheat.

Instead of the additive, 1+1=2 yield response he was expecting the response was more like 1+1=2.5 or 1+1=3; and this was consistent in plot and more than 20 farm-scale trials.

The research is now focusing on whether different fungicides have more or less effect, with early results indicating that newer STHI fungicides appear to have a greater effect with nitrogen than triazoles or strobilurins.

Peter is a big fan of using field-scale equipment to run trials in farmers’ fields and has been instrumental in having on-farm trials run in more than 600 locations.

“With RTK and autosteer everyone can do their own research,” he said. “If you can get 10 SANTFA members doing the same trial on farm with multiple reps it will return huge value in terms of the data generated.”

The effect of uneven seeding depth in corn shows up in the size of the corn cobs but is harder to see in a wheat crop, he said.

“If 15% of the plants emerge one or two leaf stages later than the rest it will cost around 6% in lost yield. A 6% yield increase from a new wheat variety would attract the interest of most farmers so the implications of seed placement are significant.”

A starter fertiliser containing phosphorus is essential for wheat, particularly in tough years, Peter said, and regardless of soil phosphorus tests, “if you want to grow the best wheat crop you need to band P with the seed. Forget about using chicken manure in place of that!”

Row width is also an issue.

“When we went from 380mm to 190mm rows in Canada we got an 8% gain in yield. Depending on latitude and sunshine, reducing the row spacing from 190mm to 100mm produced from zero to 4% further yield increase. In general terms that is essentially about 1% yield increase for every 25mm reduction in row spacing.”

Weed control

Row spacing impacts weed control too. “If wheat is grown in 250mm rows we have to spray every acre every year because there’s not enough crop competition.



PETER JOHNSON’S CLAIM THAT ANYONE WITH RTK AND AUTOSTEER CAN DO THEIR OWN RESEARCH IS REINFORCED BY THIS AERIAL IMAGE OF A TRIAL IN A CANADIAN GROWER’S Paddock.

“You can lose 25% of the potential yield if wild oats emerge six days before the wheat does. If they emerge five days after the wheat there’s no yield loss at all.

“If your crop has weeds in it at the three-leaf stage the yield loss is irreversible.”

At least part of the yield loss is due to the weeds changing the growth of the crop plants, he said.

“The crop actually senses the quality of the light, which is influenced by the adjacent weeds. When the wheat senses the competition it changes its growth habit, putting on more top growth and less root growth in order to out-compete the weeds for sunlight. That reduction in the root system reduces the crop’s ability to take up water and yield loss can result.”